# Aviation Consumer Action Project (ACAP) Questions and Comments Through ARAC Ex-Com on the June 2001 FTIHWG Final Report

**Section/Page Number** **Comment/Question**

**Page 1-7, par. 2**
**As there was no consensus of a key assumption that a 75% reduction in the accident rate should be used based on SFAR #88, the report should identify who the majority and minority are on this important point and the majority and minority should articulate their reasons for agreeing or disagreeing with this assumption.**

**Response:**
At the Working Group meeting held prior to release of the final Report to the Executive Committee there was general consensus on the assumption to use a 75% reduction in the accident rate based on SFAR 88. General censuses is defined in the ARAC operating procedures as:

> "General Consensus means that, although there may be disagreement among the members of the group, the group has heard, recognized, acknowledged, and reconciled the concerns or objections to the general acceptability of the group. Although not every member fully agrees in context and principle, all members support the overall position of the group and agree not to object to the proposed recommendation."

The ground rules also provide for confidentiality during the voting process.

Additionally, a sensitivity analysis was conducted after the final report was completed to evaluate the range of opinion on the reduction in the accident rate due to SFAR 88. This sensitivity analysis was presented at the Executive Committee meeting August 8, 2001 and has been added to the Executive Summary.

**Page 1-8**
**Why is there such a great difference in avoided fatalities for Ground Based Inerting versus On Board systems (OBIGGS) 132 vs. 253?**

**Response:**
Ground Based Inerting (GBI) was designed to inert the Center Wing Tank only, while the Onboard Inert Gas Generating System (OBIGGS) was designed to inert all fuel tanks. Because OBIGGS keeps all the tanks inert through all flight phases, it is more effective at preventing fatalities from explosion occurring on the ground and in-flight (152 for OBIGGS vs. 127 for GBI). For the same reasons, OBIGGS is also more effective at preventing fatalities associated with post-crash fires (101 for OBIGGS vs. 5 for GBI).

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**Page 1-9**
**Please explain why the cost benefit analysis ratio for Hybrid OBIGGS (HCWT only) option would not change as follows based on the following assumptions**:

**If no improvement assumed from SFAR 88 10:1**
If there were no improvement due to SFAR 88, the cost-benefit ratio for Scenario 7 (Hybrid OBIGGS -HCWT only) would be approximately 10:1. The range of opinion within the Working Group was 25% to 90% SFAR 88 effectiveness.

**Plus if reliability is 50% better than 20 year old systems 5:1**
The system reliability used in this study is already more than 50% better than 20-year-old systems designs.

**Plus if investment cost is amortized over 30 years instead of expensed over 1-10 years**
**1:1**
For the most systems, the capital costs were only about 30% of the total cost. They were expensed in the year in which they were incurred throughout the 16 year study period, not just years 1-10.

Most of the capital equipment would need to be replaced within 30 years. Once the replacement costs are accounted for, amortizing over 30 years would not reduce the total cost.

**Plus if pain and suffering and potential punitive damage awards are assumed at $2 million per victim 1:2**

The study used $2.7 million per accident victim.

**Plus if inflation adjustment for benefits is 7% per year 1:3**

Inflation would affect both the costs as well as the benefits. Increasing the inflation would not change the cost-benefit ratio.

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**Page 3-2**
**How can a major assumption involving reduction of accident risk be justified based on reduction of ignition sources if the ignition sources of the past three accidents "have not been identified"?**

**Response:**
It was the general consensus of the FTIHWG that the ignition source reduction assumption of 75% was reasonable. Further, a sensitivity analysis was done and the assumption was varied from 25% to 90% as discussed at the last Ex-Com meeting on August 8, 2001. The results of the sensitivity analysis will be included in the revised executive summary in the final report.

**Figure 11-4**
**Please state the assumption and explain the calculations by which the Net Present Value NPV were performed for Costs and Benefits for each option.**

**Response:**
This question asked for explanations of the calculations of Net Present Value for costs and benefits. The Team concluded that the explanation provided on page 11-1 under METHODOLOGY was intended to answer this question for the reader. Basically, the benefits were estimated for the year in which they were expected to accrue, and likewise the costs. Both costs and benefits were inflated from current year values by 3% per year. To get the net present value, these costs were discounted by 10% per year to the year 2005.

**Figure 5-17**
**Why are the Benefits different here than in Figure 11-4, $168 million vs. $95 million NPV in 2005 Benefits?**

**Response:**
This question seeks to clarify a discrepancy between Figures (Scenario 11-Ground Based Inerting, HCWT Only. All Transports, [US Passenger only] 5-17 and 11-4 (Cost Summary-Worldwide Fleet, Passenger Planes). The team concluded that the questioner might have misinterpreted the figure labeling in the report. Figure 5-17 on the upper half of page 5-18 depicts Scenario 11 (Ground Based Inerting, HCWT Only. All Transports, [US Passenger only]), which indicates for U.S. operators only an NPV of about $95 million for the benefits. This corresponds to Figure 11-5, Cost Summary-U.S. Fleet, Passenger Planes Only, not 11-4 (Cost Summary-Worldwide Fleet, Passenger Planes) at the bottom of page 11-6 which indicates $95 million NPV for benefits of Scenario 11, U.S. operators only.

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**Figure 7-14 Scenario 1**
**Was inflation included in Total Benefits? If so how?**

**Response:**
The question related to how inflation was factored into the calculations. As set forth above, inflation was assumed to be 3% per year for both benefits and costs.

**Page 8-6 Component Reliability**
**How reliable is this component reliability estimate?**
**What about new equipment and 1998 Report by the Fuel Tank Harmonization Working Group's estimates which show much lower operation and maintenance costs?**

**Response:**
The reliability estimate for the common components, i.e. valves, fans, wiring, etc., was based on data for similar components used in similar applications on commercial aircraft. Therefore, the reliability estimate should be very good.

In-service commercial aircraft reliability data for components unique to inerting systems was not readily available. Therefore data was obtained for equipment currently being used in various applications. For example, the inerting equipment suppliers estimated reliability data for membrane technology based on equipment being used in industrial and military applications.

As another example, in-service data was not available for the compressor, therefore the reliability estimate was made by a detailed component level analysis. Component reliabilities (motor stator, bearings etc) were taken from databases built on in-service data.

The operation and maintenance costs for the 1998 Report did not have the benefit of a review by maintenance experts as this ARAC does. The 1998 Report costs were ROM costs and the team recognized that all of the costs involved were not captured in time for that report.

The information was not available at the time of publication for public release from the Air Force.

**Page 12-1 How was "practicality" defined?**
**This is a key term but I do not see a definition.**

**Response:**

When assessing the practicality of the inerting systems the following considerations were included:

- Safety benefit versus added hazards and costs
- Technology (system/equipment) maturity

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- Compatibility with other aircraft systems (integration)
- Weight impact: loss of seating capacity ; impact on aircraft performance
- Reliability: dispatch, in-flight (ability to reach destination), equipment replacement
- Maintainability: ease and interval
- Infrastructure to ensure system operation: airport facilities, fluid (i.e. NEA), etc.
- Compliance with FAR's

**Page 13-1 Safety Assessment items 2 and 4**
**How? and How Much?**

Item 2: "Ignition source reduction activities associated with SFAR no. 88 are expected to provide a reduction in the fuel tank explosion rate."

**Response:**
The general consensus of the FTIHWG was that ignition source reduction assumption of 75% was reasonable. Further, a sensitivity analysis was done and the assumption was varied from 25% to 90% as discussed at the last Ex-Com meeting on August 8, 2001. While every effort is being made to fully comply with SFAR no. 88 it is recognized that the risk of having an ignition source present can never be fully eliminated and the SFAR effectiveness assumption recognizes that.

Item 4: "The flammability exposure levels achieved by inerting systems can result in an improvement in the accident rate."

**Response:**
As discussed in the report inerting can substantially reduce fuel tank flammability, as a result the risk of explosion is also reduced. The fuel tank explosion accident rate for the entire fleet (weighted average of all six generic airplanes) is currently ~$5 \times 10^{-9}$ per hour. With SFAR no. 88 fully implemented at 75% effectiveness, the fuel tank explosion accident rate is forecast to drop to ~$1.3 \times 10^{-9}$ per hour. If GBI were implemented, the fuel tank explosion accident rate is forecast to drop to ~$3 \times 10^{-10}$ per hour. If an Onboard Inert Gas Generating system were implemented, the fuel tank explosion accident rate is forecast to be ~$1.5 \times 10^{-10}$ per hour.

**Page 13-1 Ground Based Inerting item 5**
**Please explain why.**

The question has to do with:
"Because an OBGIS runs only on the ground, interference with other airplane systems would be minimized and the certification process should be simpler."

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**Response:**
Systems that must operate properly per their function and not interfere with any other equipment required. Normally this is accomplished with ground and flight tests, which the FAA may deem necessary after each retrofit installation.

A system that operates only on the ground, and is shut off prior to flight, can be shown to not interfere with any other equipment required for flight. Once certified not to interfere, only ground operational tests would be required to show proper operation. This saves time and money as shown in this report.

**Page 13-1 Ground-Based Inerting,**
**Item 1 Why?**

The questions refers to:
" Installing the airplane portion of a GBI system does not require any new technology to be developed. However, retrofit GBI systems will be extremely difficult and will require an evaluation of each airplane category model to determine if a retrofit installation is practical. "

**Response:**
The retrofit manifold will need to be designed to avoid interference with already installed systems such as vent systems, FQIS probes/sensors/wiring, refuel manifolds, and cross-feed manifolds. The design will thus require more internal support brackets on ribs and stringers to accommodate the non-optimum routing.

Structure penetrations of major structure items (i.e. spars and ribs) are expected to be required. The feasibility of introducing these penetrations in the structure will be dependent upon the structure design philosophy applied to the particular aircraft model, and in the in-service history of a particular aircraft (i.e. have previous repairs already been carried out due to previous in service events).

Specific aircraft type design modifications, such as reinforcing plates to ensure the strength of the existing parts are not compromised, would be necessary. This will increase the amount of drilling/machining necessary inside the tank. To carry out these operations special drilling fixtures will be required, particularly in areas of tight access due to the proximity of stiffeners on the ribs, spars and skins. The location of the GBI manifold will be near the top of the tank to avoid impeding access to the tank for maintenance and to minimize fuel submergence during GBI.

It was assumed that it would be possible to avoid removing the majority of the existing fuel system installation to install the new manifold. However, special protective tooling is likely to be required for the FQIS electrical harnesses to ensure they are not inadvertently damaged during drilling/ installation activity. The cost of replacing an FQIS harness is major, and was not assumed as part of the retrofit GBI installation.

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Modifications to existing vent systems to preclude cross venting would be necessary for a large portion of the fleet. The design changes to accomplish this have not been developed, and require careful consideration to assure these modifications do not introduce new safety issues.

All of the above factors, would contribute to the difficulty and costs associated with retrofitting a GBI system installation.

Subsequent to the ARAC task team effort and final report, the FAA has accomplished testing that suggests the distribution of nitrogen to each tank bay may not be necessary. The distribution system details would be designed for each aircraft with the objective of minimizing the impact. Methods to economize are a part of detailed design. However, it is also appropriate to note that savings during detailed design are often offset or exceeded by complications not accounted for in preliminary design studies similar to that done for this ARAC.

**Item 2: Why not part of fuelling operation**

This question refers to:
The availability of airport supply systems to supply NEA at each terminal gate and remote parking area is a serious problem that needs to be resolved before GBI can be implemented.

*Section 10.17 of the report Para 10.3.2.3 also covers this issue.*

**Response:**
The Terms of Reference requested that the system inert the fuel tank at arrival. Depending on the fuel load and aircraft size inerting may be completed before, at the same time, or after refueling. If directly linked to the refuel there would be a knock on effect to refueling other aircraft since the refuel truck for example would have to wait until both operations were completed. The location of the connection for the NEA on the aircraft will be near the center tank. Aircraft refuel connections are typically outboard of the engine or between the engines. To minimize the impact on the ground operation of the aircraft the ground based on- board system has been designed so that it can be performed at any time.

Due to the physical separation of the two connections it will not be possible to observe or monitor each connection without walking between each one. In the event of an interruption of one of the servicing operations increased delay would result since to trouble shoot one system would require the other operation to be suspended.

**Page 13-2 Airport Facilities Item 4**
**Aren't there systems that capture VOC?**

Item 4 states:

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"Significant volumes of VOC were released during both processes, regardless of inert gas used. This increase in VOC emissions should be investigated and resolved to avoid any serious potential health, environmental, and safety issues."

**Response:**
Vapor recovery systems are not presently installed or required on airplane or fuel handling systems handling Jet-A type fuel. If the increase of hydrocarbon emissions caused by GBI becomes a subject for regulatory action this may require modification to the aircraft vent system and a means of vapor recovery at each fueling position. The costs of this were not included in the study.

The natural occurring VOC release from jet fuel is relatively minor due to its low vapor pressure and is therefore generally exempt from capture. The two operations referred to in this statement – aircraft fuel tank ullage washing and fuel scrubbing (displacing entrained oxygen with NEA) introduces the physical removal of normally stable light end components from the jet fuel.

Preliminary laboratory tests conducted on both processes, using various inert gases, indicates that not only is there a significant VOC volume increase but also the driving off of other components that normally remain entrained within the fuel. The release of these other components tends to form unacceptable concentrations of otherwise non-lethal hazardous material when in their natural state. Therefore, the Working Group recommended that additional investigation into this matter be carried out before implementation of a NEA inerting process for today's transport category aircraft.

**Page 13-2 Onboard Inert Gas Generating System,**
**Item 4 What airliners are you referring to?**

Item 4 states,
" The weight of an installed OBIGGS is significant; for example, for a large transport category airplane, the OBIGGS weighs between 1,120 and 1,600 lb."

**Response:**
The study used the same six generic aircraft that were specified for the 1998 ARAC FTHWG study. These are representative of the fleet without being specific to one manufacturer. The "large" aircraft have a 350 or greater passenger capacity.

**13-2 Onboard Inert Gas Generating System,**
**Item 6, 8 What is the basis for this? Was the reliability number used for current systems or 20 year old military systems?**

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This question refers to:
" Item 6: Current technology components of an OBIGGS have demonstrated low reliability."

**Item 8**: NEA membrane air separation systems that have improved efficiency and performance, and lower nonrecurring costs would be a necessary part of a practical membrane-type OBIGGS."

**Response:**
Items 6 and 8 refer to different aspects of OBIGGS systems. Item 6 refers to the C-17 system, which does not have sufficient reliability for use in commercial aircraft service. The lessons learned from this system were applied to the inerting concepts in this report in order to avoid the low reliability components. No other system currently exists with the capacity to inert transport aircraft fuel tanks so the inerting equipment suppliers must project reliability estimates for the conceptual systems presented in this report.

Item 8 refers to the latest technology in production from suppliers of inert-gas generating equipment and has nothing to do with reliability, but rather feasibility. This equipment must produce more nitrogen from less supply air to be feasible. The suppliers have indicated that R&D efforts are being undertaken to improve the efficiency but improvements will only occur with a "scientific breakthrough".

Reliability was based on existing components and supplier projections as presented in the response to question 8-6.

**Page 13-3 Airplane O & M, Item 4**
**Why is 0.7% to 0.1% down time necessary?**

Item 4 refers to the reliability of inerting systems, it states:
"The current reliability of inerting system technology is unacceptable from a maintenance and operational viewpoint and requires an order of magnitude improvement to make them operationally viable."

**Response:**
Improvements in reliability are necessary to ensure that the inerting system does not cause a significant decrease in overall dispatch reliability. A significant decrease in dispatch reliability would lead to a systemic effect on airplane utilization.

**Page 13-3 Estimating and Forecasting, Item 3**
**Why aren't these systems practical?**

Item 3 states:
"Of the design concepts studied, the one with the lowest cost-benefit ratio was the GBI and the hybrid OBIGGS concept applicable to heated CWTs only."

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**Response:**
The general consensus of the Working Group was that fuel tank inerting will take many years to implement and will have an enormous operational impact, with costs that far exceed the benefits. Based upon these factors, the consensus was that these inerting systems were not practical at this time.

When assessing the practicality of the inerting systems the following considerations were included:

- Safety benefit versus added hazards and costs
- Technology (system/equipment) maturity
- Compatibility with other aircraft systems (integration)
- Weight impact: loss of seating capacity; impact on aircraft performance
- Reliability: dispatch, in-flight (ability to reach destination), equipment replacement
- Maintainability: ease and interval
- Infrastructure to ensure system operation: airport facilities, fluid (i.e. NEA), etc.
- Compliance with FAR's

**General Questions**

1) **What is the basis for concluding that fuel tank inerting is not practical based solely of the WG's cost benefit analysis?**

**Response:**
The general consensus of the Working Group was that fuel tank inerting will take many years to implement and will have an enormous operational impact, with costs that far exceed the benefits as calculated in accordance with the standard Department of Transportation formula.

Based upon these factors, the consensus was that these inerting systems were not practical at this time.

The cost-benefit analysis is a part of the regulatory evaluation process. The terms of reference required that any recommended inerting system meet regulatory evaluation criteria. When assessing the practicality of the inerting systems the working group also considered:

- Safety benefit versus added hazards
- Technology (system/equipment) maturity
- Compatibility with other aircraft systems (integration)
- Weight impact: loss of seating capacity ; impact on aircraft performance
- Reliability: dispatch, in-flight (ability to reach destination), equipment replacement
- Maintainability: ease and interval

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- Infrastructure to ensure system operation: airport facilities, fluid (i.e. NEA), etc.
- Compliance with FAR's

**2) Who are the economists who crunched the numbers for the cost benefit analysis and what are their affiliations and qualifications?**

Allen A. Mattes, a senior economist for the FAA, in the office of Aviation Policy and Plans, Aircraft Regulatory Branch, supported the Economic and Forecasting team. He provided guidance for setting up the cost benefit analysis. The task teams provided the data used in the analysis. A working group member supported each task team.

**3) Who are the members of the WG, their affiliations and professional qualifications?**

**Response:**
The ARAC Working Group members, listed below, were chosen from resumes submitted to the FAA. The FAA and the Chairman of the ARAC Executive Committee selected the members of the Working Group. The Working Group members were selected for two reasons: they had the skills, background, and capabilities to fully address the Terms of Reference and they represented a balanced range of industry opinions. The Working Group and task teams included designers and manufacturers of inerting systems.

# Aviation Consumer Action Project (ACAP) Questions and Comments Through ARAC Ex-Com on the June 2001 FTIHWG Final Report

| Name | Representing | Company |
|---|---|---|
| Brad Moravec | Aerospace Industries Association (AIA) | The Boeing Company |
| Sean O'Callaghan | Association of European Airlines (AEA) | British Airways |
| G. Michael Collins | Federal Aviation Administration (FAA) | FAA, Transport Airplane Directorate |
| Laurent Gruz | Joint Aviation Authorities (JAA) | Direction Générale de l'Aviation Civile (France) (DGAC) |
| Anne Jany | European Association of Aerospace Industries (AECMA) | Airbus |
| James Hurd (Alternate) | Public Interest Groups | National Air Disaster Alliance / Foundation (NADA / F) |
| C. William Kauffman | Public Interest Groups | National Air Disaster Alliance / Foundation (NADA / F) |
| Charlie Osonitsch | Small Transport Aircraft Manufacturer | Gulfstream Aerospace |
| Karl Beers | Inert Gas Equipment Manufacturing | Air Liquide - MEDAL |
| Brian Sutton | Airline Pilots Association International (ALPA) | TWA /American |
| Frank O'Neill | Air Transport Association (ATA) | United Airlines |
| Jay Hiles | International Association of Machinists (IAM) | US Airways |
| David Lotterer | Regional Airline Association (RAA) | RAA |
| Ted Campbell | American Petroleum Inst.(API) | Texaco |

4) **What are the views of the designers and manufacturers of the fuel tank inerting systems on the conclusions and cost benefit analysis of the WG?**

**Response:**

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The Working Group and task teams included members who are designers and manufacturers of fuel tank inerting systems. The Working Group reached general consensus on the conclusions and recommendations.

**5) Did you consult with any economists who do not have a vested interest in the outcome of the FAA's adoption of fuel tank inerting? If so who?**

**Response:**
The FAA economist, who is impartial, was the only one on the study.

**6) What is the per ticket cost of the various fuel tank inerting options?**
**Isn't it true that the total cost of fuel tank inerting is about 1/6% of airline revenue according to your calculations?**

**Response:**
The net cost per flight, averaged over the large, medium and small generic airplanes, ranges from $72 (hybrid OBIGGS) to $128 (Full OBIGGS). Over the portion of the study period where inerting would be used (2008-2020), the net cost per ticket would be $0.45 to $0.98. It was assumed that this cost would be applied to all tickets regardless of whether an inerting system was installed or not.

The FAA may be able to provide this airline revenue data; it was not used in our calculations.

**7) Why have you not developed regulatory text as required by the tasking statement? How many lawyers (regulatory and air crash tort) were on the WG? What were their affiliations and expertise?**

**Response:**
Chapter 12 and Appendix I provide comprehensive regulatory text. No lawyers were assigned to the Working Group because the tasking requested only “recommended” regulatory text. The FAA does not assign lawyers for drafting “recommended” regulatory text.

**8) Where is the analysis for your recommendation that new aircraft designs could substantially reduce risk and cost of preventing fuel tank explosions?**

**Response:**
This question pertains to the Co-Chairmen's recommendation that the FAA and Industry study means other than inerting to reduce fuel tank flammability. In general, the FAA's fuel tank flammability model was used to evaluate the effects of ground cart cooling, improved insulation between the Center Wing Tank and adjacent heat sources, and improved fuel scavenging.

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# Aviation Consumer Action Project (ACAP) Questions and Comments Through ARAC Ex-Com on the June 2001 FTIHWG Final Report

## *Co-Chair Recommendations*

**Examples of alternative flammability reductions methods using the ARAC fleet-wide flammability exposure model**

Percent Exposure of Airplane Types

| Airplane Configuration | LARGE | MEDIUM | SMALL |
|---|---|---|---|
| Baseline | **36.2** | **23.5** | **30.6** |
| Duct Insulation | **26.3** | **19.9** | **23.9** |
| Ground Cart Cooling | **26.7** | **16.9** | **20.2** |
| Duct Insulation & Ground Carts | **18.5** | **12.3** | **16.2** |
| Reduced Residual Fuel | **33.5** | **20.0** | **27.4** |
| Duct Insulation with Reduced Residual Fuel | **23.8** | **16.3** | **22.7** |
| Ground Cart Cooling with Reduced Residual Fuel | **23.4** | **13.1** | **19.2** |
| Duct Insul & Grd Carts w/ Reduced Residual Fuel | **15.9** | **10.0** | **15.2** |

**Conclusion:** The flammability model results show that a combination of hardware and procedure changes may lower fuel tank flammability exposure by more than half.

**9) How has the views and experience of military aviation that has used fuel tank inerting been used by the WG?**

**Response:**
The task teams included participants from the US Navy and industry engineers who have worked on military inerting systems. Their efforts were used extensively in preparing this report.

**10) Isn't it true that a $3 Billion annual cost equates to a per flight cost of 16 cents over 20 years and 33 cents over 10 years?**

**Response:**
The net cost per flight, averaged over the large, medium and small generic airplanes, ranges from $72 (hybrid OBIGGS) to $128 (Full OBIGGS). Over the portion of the study period where inerting would be used (2008-2020), the net cost per ticket would be $0.45 to $0.98. It was assumed that this cost would be applied to all tickets regardless of whether an inerting system was installed or not.

**11) What is the legal basis for the position that cost benefit analysis is the only or main factor for the FAA to determine whether or not to require fuel tank inerting?**

**Response:**

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The cost-benefit analysis is not the only or main factor for the FAA to use to determine whether or not to propose a rule. Under the Sept. 30, 1993, Executive Order #12866, a Federal agency must perform a cost-benefit analysis when proposing a rule. However, the Federal agency should select the approach that would maximize net benefits (including potential economic, safety, and other impacts). The cost-benefit analysis is only one of several factors affecting an Agency's decision to propose or not to propose. In other words, there is no legal requirement that a positive net benefit is a requirement for a Federal agency to issue a proposed regulation.

**12) Did you consider the indirect costs to the industry of lower revenue caused by accidents, the investigation and litigation costs?**

**Response:**
The benefits included DOT's latest estimate of the amount society would pay to prevent a potential fatality ($2.7 million), the value of the destroyed airplane, value of ground damage and accident investigation.

**13) Did you consider the non-economic costs of human pain, misery and suffering caused by failing to prevent accidents that are preventable with currently available technology?**

**Response:**
The benefits included DOT's latest estimate of the amount society would pay to prevent a potential fatality.

Allen Mattes input:
The benefits included the DOT's latest estimate of the amount society would pay to prevent a potential fatality. This value, which is periodically revised to account for inflation, is based on a survey performed by the Urban Institute (<u>The Cost of Highway Crashes</u>, June 1991) of studies that have estimated the amounts society is willing to pay for reduced risk of fatalities. The willingness to pay approach attempts to value an average of all the benefits arising from the prevention of a fatality.

**14) Did you consider the overall costs to the US economy of a policy that authorizes airlines and manufacturers to not fix a known hazard to air travelers, especially if it leads to series of preventable accidents killing hundreds of air travelers? The Comet syndrome? The potential bankruptcy of airlines (ie Pan Am after Pan Am 103)? The potential liability of the US government and industry officials for such policies leading to many preventable deaths? The professional reputations of those involved in promoting such policies? The morality of recommending a policy that will knowingly cause a horrible death for hundreds of air travelers?**

**Response:**
The qualified benefits of accident prevention are discussed in chapter 11 of the report. They include DOT's latest estimate of the amount society would pay to prevent a potential fatality ($2.7 million), the

value of the destroyed airplane, value of ground damage and accident investigation

**15) Are there not other cost benefit analyses available to WG members that show much lower costs and higher benefits?**

**Response:**
Yes, other cost-benefit analyses used by the Working Group include the 1998 ARAC study and the FAA's Ground Based Inerting Study (DOT/FAA/AR-00/19). Although the studies are not directly comparable, data from both these studies were used.

**16) Have the Industry members of the WG met privately to pre-determine or decide their strategy to oppose fuel tank inerting a biased cost benefit analysis?**

**Response:**
No, the WG is not aware of any privately held meetings. The ARAC process was used to develop an industry consensus on the response to the Tasking Statement.

**17) What instructions or pressures have been brought to bear on WG members by their superiors to come up with a negative recommendation on fuel tank inerting?**

**Response:**
The Working Group recommended that the FAA and industry continue research and development on inerting systems. This should not be considered a negative recommendation. Additionally, the Working Group is not aware of any members that were pressured to take a position they did not agree with.